



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER OF PATENTS AND TRADEMARKS  
Washington, D.C. 20231  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09 677,781	10/02/2000	Katsuhide Manabe	PM273686	4206

909 7590 02/12/2002

PILLSBURY WINTHROP LLP  
1600 TYSONS BOULEVARD  
MCLEAN, VA 22102

EXAMINER
----------

MULPURI, SAVITRI

ART UNIT	PAPER NUMBER
----------	--------------

2812

DATE MAILED: 02/12/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**Application No.  
**09/677,781**Applicant(s)  
**Manabe E T Al**Examiner  
**Savitri Mulpuri**Art Unit  
**2812**

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 5 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on Nov 28, 2001
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 53-118 is/are pending in the application.
- 4a) Of the above, claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 53-118 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claims \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. § 119**

- 13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).
- a) ☐ All b) ☐ Some\* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\*See the attached detailed Office action for a list of the certified copies not received.

- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

**Attachment(s)**

- 15) ☐ Notice of References Cited (PTO-892)
- 16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 17) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s). 7
- 18) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 19) ☐ Notice of Informal Patent Application (PTO-152)
- 20) ☐ Other: \_\_\_\_\_

Art Unit:

### DETAILED ACTION

This action is in response to the applicant's response filed on 11/28/01 cancelling 19-52.

#### *Claim Rejections - 35 USC § 112*

1. Claims 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98, 100, 102, 104, 106, 108, 110, 114, 116, 118 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. There is no support for the range of claimed limitation silane to ammonia ratio of  $6 \times 10^{-10}$  to  $2.6 \times 10^{-8}$

2. Claims 111, 112 needs to be canceled because claim 111, 112 are depending on canceled claims 19, 20

#### *Claim Rejections - 35 USC § 103*

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 53, 55,

57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109,

Art Unit:

113,115,117 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kahn et al in combination with Koide et al and Keyyan Rahim Sayyah et al.

Kahn et al discloses a method growing epitaxial layers by the following process steps: Providing a sapphire substrate; growing buffer layer of AlN; and then growing a gallium nitride compound layer on AlN buffer layer, wherein gallium nitride compound layer is AlGa<sub>0.5</sub>N layer. Kahn et al discloses AlGa<sub>0.5</sub>N layer with n-type dopant concentration approximately at  $10^{18}/\text{cm}^3$ . Kahn et al does not explicitly teach conductivity (1/resistivity). However, since Khan et al teaches the concentration of the n-type dopants is with the limit as of the claimed concentration, inherently the conductivity in the Khan et al must be with in the claimed range from 3.4 /ohm-cm to 130 /ohm cm. Khan et al does not examples n-type dopants. However, silicon is the most common and preferred element in the gallium nitride compound semiconductor materials.

Khan et al do not disclose following limitations (1) growing GaN by providing TMG at a temperature in the range of -15 to -12.5 C, (2) ratio of silane to TMG is  $10^{-2}$  to  $10^{-1}$ .

Koide et al discloses growing GaN by TMG at a temperature in the range of -15 to -12.5 C (see left col. 1, lines 1-5). It would have been obvious to one of ordinary skill in the art to grow at low temperature because Koide process is to reduce parasitic reaction between metal organic compounds with ammonia thereby producing AlGa<sub>0.5</sub>N layers with controlled composition (see abstract).

Keyyan Rahim Sayyah et al discloses the ratio of silane to TMG is  $10^{-2}$  to  $10^{-1}$ , which is within the range of claimed limitation of 0.1 to 3 in claims 53, 55. It would have been obvious to

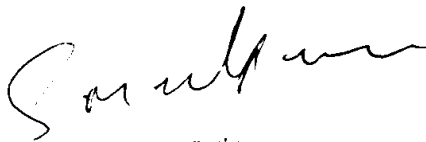
Art Unit:

one of ordinary skill in the art to the ratio of silane to TMG as suggested by Keyyan Rahim Sayyah et al. Beacuse such range is suitable for growing GaN layers.

Exmainer position ove the claims 53-118 is now changed because of further reviw and analysis of the appllied and cited patents and publications.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to S. Muklpuri whose telephone number is (703) 305-5184. The fax phone number for the organization where this application or proceeding is assigned is (703) 308-7722.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

  
SAVITRI MULPURI  
PRIMARY EXAMINER